acters. Many suggestions are made to explain this, such as: in regions of high latitude or altitude, xerophilous characters lessen evaporation early in the season, when the roots are inactive, due to cold soil; or the activity of the roots is hindered by the difficulty of aeration, hence the need of lessened evaporation; or, again, since the stomata remaining open, cannot regulate evaporation, xerophilous characters are necessary.

The most probable explanation of the presence of xerophilous characters in halophytes is that the roots have difficulty in obtaining water from the strong solution of salts in which they are placed, hence the necessity of lessened evaporation.

The closing section treats of the struggle between the various plant communities.

The book should be read by every student of ecology; but more, the general reader would be amply repaid by its perusal. It is to be hoped that the book may be translated into English.*—A. S. HITCHCOCK.

ZOOLOGY.

The Gas of the Natatory Vessels of Physalia and of Fishes.[1]—As a result of a search[2] for argon in the natatory vessels of *Physalia* and of fishes there were found in the vessel of the former (*Physalia pelagica* Lk) from 85–91 per cent. of nitrogen, and from 9–15 per cent. of oxygen, but no other gas. In the swimming bladder of surface fish (*Polyprion cernium* Val.) there was found about 80 per cent. of nitrogen, 18 per cent. of oxygen, and 2 per cent. of carbonic acid gas, while in deep sea forms, such as *Muræna helena*, taken from a depth of 88 meters, and *Synaphobranchus pinnatus* Gr., taken from a depth of 1385 meters, 3–6 per cent. of carbonic acid gas and oxygen in the large amount of 73–85 per cent. were found.

The Genus Ascaris.—In his monographic work[3] devoted to this genus of worms, Stossich considers 218 species. Of this number 35

*An English translation of this book is now in preparation and will be published by Macmillan.—ED.

[1] Richard A. (96). Sur les gas de la vessie natatoire des poissons et des physalies. Bull. Mus. Hist. Nat., Paris, 41–3.

[2] Schloesing, Th., and Richard J. (96). Recherche de l'organ dans les gas de la vessie natatoire des poissons et des physalies. Compt. Rend. Ae. P., CXXII, 615–7.

Zool. Centralbl., IV, 19.

[3] Bull. Soc. Adriat. Sc. Nat., Trieste, XVII (1896), pp. 7–120. Zool. Centralbl., IV (1897), p. 20.

occur in mammals, 47 in birds, 29 in reptiles, 5 in amphibians, 98 in fishes, 1 in an insect, and 1 in an unknown host. 117 of the lot, are doubtful forms. The remaining 101 Stossich divides into groups: (1) those with a dentated fold and no median lip; (2) those with both dentated fold and a median lip; (3) those with the median lip but not the dentated fold; and (4) those with three simple lips. 32 of the lot are larval forms mostly from fishes.

The Excretory Organs and the Blood-Vascular System of Tetrastema græcense Böhmig.[4]—The small fresh-water nemertine that was first discovered by Böhmig in 1892 has since then been found in sufficient numbers to enable its discoverer to give a brief description of the excreto-genital and the vascular systems. The former is easily recognized in compressed animals, and appears as a system of coiled and anastomosing tubes along each side for the whole length of the animal. The tubes of opposite sides do not unite, although their very close contact sometimes causes them to seem to do so. At the anterior end of the animal near the brain there is only one canal, which is large, coiled, and looped, and ends finally in a meshwork-like system of smaller canals. Nothing like it appears at the opposite end of the animal. Into the larger, as well as into the smaller canals, empty numerous fine canals, which arise from the end-organs.

In the organs, he distinguishes three portions: (1) the terminal canals, (2) the connecting canals, and (3) the end-organs. The first lie mostly between the external muscle layer and the intestine, and are formed by cells unprovided with cilia. They connect with the excretory pores, of which there may or may not be an equal number on each side of the animal. In one case there were 5 pores to a side; in another, 6 on one, and 3 on the other side.

The connecting canals are distinguishable from the others by their greater thickness and the nature of their bordening cells, which bear cilia. The rounded, superficially smooth end-organs are provided at their free ends with two (seldom only one) flame cells, and seem to be formed by 3–5 cells resembling those of the terminal canals in appearance. In general it may be said that they communicate with the terminal canals only through the mediumship of the connecting canals. Yet, a direct connection between the two has been seen.

The vascular system consists of 3 branches, 2 lateral vessels, and a dorsal vessel. Near the brain the last communicates with the right

[4] Böhmig (97). Vorläufige Mittheilung über die Excretionsorgane und das Blutgefässystem von *Tetrastema græcense* Böhmig. Zool. Anz., XX, 33–6.

lateral vessel, and posteriorly with both the right and left vessels through an anal commissure. The walls of the vessels are formed of (1) an inner endothelial, (2) a circular muscular layer, and (3) an outer layer of mesenchymal cells arranged like an epithelium. Between the endothelial and the muscular layers are large cells of a hemispherical form and peculiar structure, which, at the moment of diastole, stand out from the wall of the vessel, and at the time of systole plunge into it. They appear to guide the flow of the blood.

A connection between the nephridia and the vascular system, such as Berger has described for marine nemertines, especiallly for *Drepanophorus*, does not occur.

The Existence of Epitokic Forms in the Annelid Family Cirratulidæ.[5]—Two members of this family, namely, *Dodecaceria concharum* Örst. (=*Heterocirrus ater* Qfg.) and *Heterocirrus flavoviridis* St. Jas. have been found in an epitokic stage, which differs from that of certain of the Licoridæ and Syllidæ: (1) in the possession of very long swimming processes in the dorsal branch of the parapodia, (2) in having two highly developed eyes on the cephalic lobe, (3) in the shortness of the feeler of the first segment, (4) in the slightly spatula-form of the end of the body, (5) in the irregular coloring, (6) in a different musculature, and (7) in the possession of mature sexual products. The individuals are of different sexes. In August atokic and epitokic forms as well as connecting forms are found side by side.

A Study of the Form of the Crop of the Libellulidæ and their Larvæ.[6]—Recently a number of anatomical observations made by the author cited, on the form of the crop, the distribution of the "teeth," etc., in the same, have been made use of for systematic and phylogenetic purposes. A series of the larvæ and imagines of the genera, *Calopteryx*, *Agrion*, *Pyrrhosoma*, *Erythromma*, *Enallagma*, *Ishnura*, *Platycnemis*, *Lestes*, *Gomphus*, *Æschna*, *Anax*, *Corduligaster*, *Diplax*, *Libellula*, *Epophthalmia*, *Cordulia*, and *Orthetrum*, were studied, and as a result the conclusion arrived at that the crop of Colopteryginæ represents the primitive form. This shows sixteen areas irregularly covered with teeth. A perfection of this form appears in the Agrioninæ, in which there is a greater supply and a more regular arrangement of the teeth. In the case of the genus *Lestes* there are but eight longitudinal folds, a number that in the gomphininæ and æschninæ

[5] Mesnil, F., and Caulbry, M. Compt. Rend. Ac. Sc. Paris, 1896.

[6] F. Ris. Untersuchung über die Gestalt des Kaumagens bei den Libellen und ihren Larven. Zool. Jahrb. Abth. Syst., IX (1896), 596–624.

is reduced to four. While the *Condulegaster* show a striking concentration of the armature, which is limited to two pairs of teeth. In fact, the original radially symmetrical arrangement is seen to have been transformed to a bilateral one. The structures are best studied in the larvæ, for they become considerably reduced and obscured in the imago. Summarizing his results in the form of a phylogenetic tree the author considers the agrioninæ and the petalurinæ to have arisen from the primitive form, calopteryginæ. Then from the petalurinæ there arose three branches, two of them terminated by the æschninæ and the gomphinæ respectively; the third passed off to one side as a low branch that formed the cordulegastrinæ. From this form there arose one branch that soon divided and finally gave rise to the corduliinæ and the Libellulinæ, the highest of the dragon-flies. The author's conclusions differ from those of Calvert in that the cordulegastrinæ form a link between the two forms represented by the subfamilies corduliinæ and Libellulinæ, and that represented by the petularinæ, instead of an independent branch.

The Regeneration of an Antenna-like Structure Instead of an Eye.—The regeneration of a structure very much resembling that animals antennula on the stump of an eye stalk of *Sicyonia sculpta* is well worth recording along with the regeneration of a well-formed lens from the iris in *Triton*, as described by Wolff and also by Müller whose paper was noted in the NATURALIST some time ago (p. 72).

The regeneration of such a structure is described by C. Herbst[7] in several out of eighty-five specimens from which he cut the eye. Only six of the eighty-five remained alive at the end of five months after the operation, but all but one of these showed evidence of a regenerated structure. Some seven other cases were secured during the five months by fixing the animals recently dead, or about to die, so that he had twelve good cases showing a regenerated structure. Similar experiments had previously been performed upon the eye stalk of *Palæmon*, with like results.

The accompanying figures represent the three groups into which Herbst divides the regenerated structures according to their degree of perfection. In the first (fig. 1) there is shown only a small protuberance (*n*) having little evidence of segmentation. In the second group (fig. 2) there is developed a large process provided with two hairy areas and a secondary two-jointed lobe that Herbst likens to a crustacean flagellum (*fr*). In the third group (fig. 3) a large antenna-like struc-

[7] C. Herbst. Festschrift der Naturf. Gesel. Zurich, 1896, pp. 435–54.

ture is developed, having, like the last structure, two hairy areas (which do not normally occur on the eye stalk), and, in addition, two

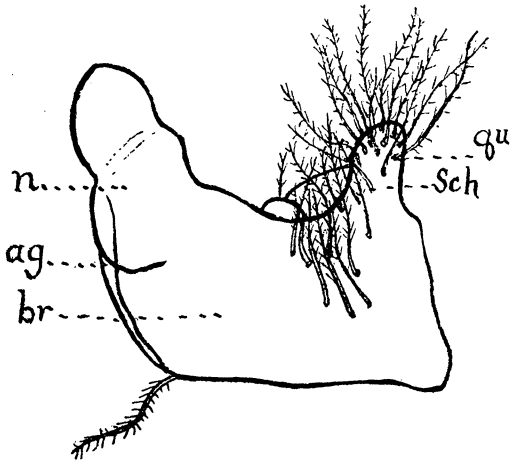

Fig. 1.

several jointed processes. This last figure scarcely needs the detailed argument that Herbst devotes to it to prove that it is antenna-like, and

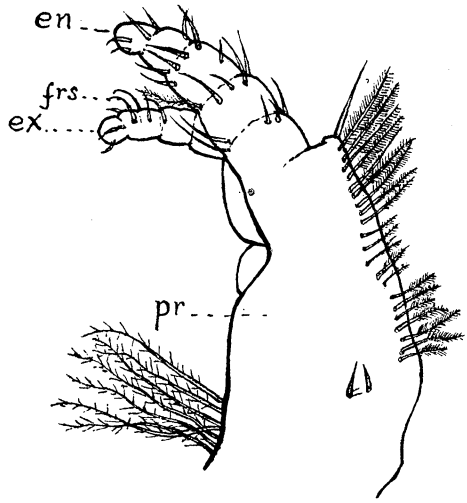

Fig. 2.

to show that the endopodite (*en*), exopodite (*ex*) and protopodite (*pr*) are represented.

The occurrence in crustacea of an antenna-like organ in the place of an eye was noted as early as 1864 by Milne-Edwards[8] in the lobster, *Palinurus penicillatus*, and later (1894) by Hofer[9] in *Astacus*. To ask what bearing these cases and the results of Herbst's experiments have upon the general question of arthopod segmentation is but to repeat the query made by Milne-Edwards. He thought that he had found new

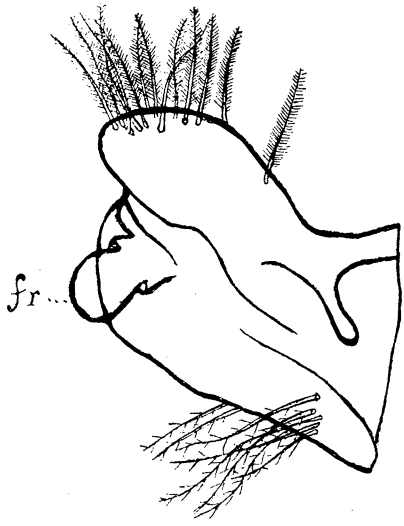

Fig. 3.

evidence of the truth of Savigny's law. Later, writers have not generally considered the eye or optic stalk as the homalogue of a segmental appendage, nor have they considered the protecerebral lobe, from which the eye is innervated, as evidence of a segment. It may be a hasty conclusion, but the cases of an antenna-like structure certainly seem to indicate that Milne-Edwards was right, and that one may in the future be obliged to consider the arthopod head as having one more segment in it than we have till now supposed it to have. Further experimentation is necessary to show what internal structures are regenerated, for Herbst seems to have made no sections whatever of the structures that he describes. One would like to know to just what extent the muscles are developed, and what happens to the stump of the optic nerve. Experiments should also be made to determine what, if

[8] Hofer. Ein Krebs mit einer Extremität statt eines Stielauges. Verh. d. Deutsch. Zool. Gesel., 1894.

[9] A. Milne-Edwards. Comp. Rend. Acad. Sci. Paris (1864) LIX, pp. 710–12.

any, differences are to be noted when the stalk is cut through at different distances from the eye so as to leave intact different portions of the optic ganglia.—F. C. KENYON.

Variability of External Sutures in the Skull of Chelone mydas L.—In a paper entitled Bemerkungen über die Systematische Stellung von Dermochelys Blainb.,[10] Baur quotes from Boulanger, as follows:

"The lower border of the post-frontal joins the jugal and the squamosal, and cantrary to what exists in the Cheloniidæ is separated from the quadrato-jugal by the two latter bones." Baur then adds that he finds the same relation in two specimens of *Chelone mydas* L.

I have before me three skulls of *Chelone mydas* L. from the Atlantic coast, one from an animal weighing about thirty pounds, and two of quite precisely the same size from specimens which weighed from sixty to seventy pounds. In the first, or small skull, I find the squamoso-jugal separation, as well as in one of the larger skulls. In the third there is a distinct squamoso-jugal union. Internally the skulls all agree. Further differences in these skulls are slight. There is apparently no order for the junction right and left of parietals and frontals, and frontals and parietals. These, with the squamoso-jugal union or non-union should be recognized as altogether variant characters in the osteology of *Chelone mydas* L.—GEO. R. WIELAND.

Lists of Mammals of Raleigh, N. C.—The following list of the mammals found near Raleigh, N. C., is based on twelve years of mammal collecting in this vicinity, and observations made since 1880 on the mammals of this locality by my brother and myself. We have preserved some 1,500 or 2,000 specimens as skins, or alcoholics, besides catching in our trapping a number of others which were not preserved. A number of specimens have been bought from the farm hands employed in ploughing, or cutting hay, thus adding considerably to our knowledge of several species, notably *Zapus hudsonius.* The country lying immediately southeast of Raleigh, where most of the collecting was done, is mostly rolling country, except along Walnut Creek, where there are considerable tracts of wet meadow and some good sized cat-tail swamps. The drier portion of the country collected over is about one-half cultivated, and the other half woodland.

The commoner mammals are distributed as follows: *Sciurus carolinensis* and *Sciuropterus volans* in woods, the third arboreal species, *Pero-*

[10] Biologische Centralblatt, Dec., 1889, Erlangen.

myscus aureolus, being an inhabitant of damp thickets. *Lepus sylvaticus*, *Peromyscus leucopus*, *Blarina carolinensis* and *Scalops aquaticus* are found nearly everywhere in woods and fields both, except in the more watery situations, where only aquatic species occur; *Microtus pinetorum* is found in the drier woods and fields; *Sigmodon hispidus* in the drier fields, but not in woods. *Mus musculus*, *Reithrodontomys lecontei*, *Blarina parva* and *Microtus pennsylvanicus* occur in open fields and the edges of the marshes, the last species penetrating the marshes much farther than the others. *Oryzomys palustris*, *Fiber zibethicus*, *Lutreola lutreocephalus* and *Lutra hudsonica* are all more or less aquatic, being found mainly or entirely along streams, or in the wet marshes. Of the bats, *Vesperugo carolinensis* is the common bat of the low grounds, and *Atalapha borealis* of the uplands.

The species observed here, are as follows:

1. *Didelphis virginianus.* Opossum. Tolerably common. I once took a litter of fourteen young ones, August 4, 1891.

2. *Lepus sylvaticus.* Cotton-tail Rabbit. Common. The young of this species are blind at birth.

3. *Mus alexandrinus.* Roof Rat. The long-tailed, white-bellied Roof Rat is common here, around houses and farm buildings, but is not found away from such places (*Mus decumanus* and *Mus rattus* I have never observed at Raleigh).

4. *Mus musculus.* House Mouse. Common in houses, and irregularly distributed throughout all open fields.

5. *Sigmodon hispidus.* Cotton Rat. Abundant in the upland fields, particularly in gardens and in grain and clover fields. By far the most diurnal in its habits of any of our mice.

6. *Peromyscus aureolus.* Golden Mouse. Common in damp thickets. Nests in reeds, bushes or vines. Our only arboreal mouse.

7. *Peromyscus leucopus.* White-footed Mouse. Abundant everywhere, except in the wet marshes. Nests in the rotten roots of old stumps below ground, or in hollows of dead stumps above ground.

8. *Oryzomys palustris.* Tolerably common in the wet marshes and cat-tail swamps. The nest is built in a bush or bulrush tussock often fifty yards from land.

9. *Reithrodontomys lecontei.* Harvest Mouse. Abundant in the open fields and on the edges of marshes, but is not found in woodlands. The few nests I have found have been in bulrush tussocks in rather damp situations.

10. *Microtus pinetorum.* Pine Mouse. Fairly common, found in the drier parts of woods and fields, and is more subterranean in its habits

than any other of our mice, and also, I think, more so than any of our Shrews.

11. *Microtus pennsylvanicus.* Meadow Mouse. Found to a greater or less extent in all open fields, but reaches its greatest abundance in the wet meadows, where its habitat overlaps that of *Oryzomys.* It is not found in the woodlands.

12. *Fiber zibethicus.* Musk Rat. Common in marshes and along the larger streams. A black color phase or variety occurs which is black above with lighter under-parts and cheeks than the common form. The black form is one-fourth or one-third as common as the ordinary brown phase.

13. *Scurius carolinensis.* Southern Gray Squirrel. Tolerably common in all woodlands (Although I have made very careful inquiries I have been unable to find any evidence that the Fox Squirrel ever occurred here).

14. *Sciuropterus volans.* Flying Squirrel. Common. Strictly nocturnal.

15. *Tamias striatus.* Chipmunk. They are fairly common about six miles west of Raleigh, but are totally absent from my immediate neighborhood.

16. *Zapus hudsonius.* Jumping Mouse. Rare. The one or two dozen specimens we have secured here come from upland, lowland, woods and open fields. An adult female and eight young were caught in a nest by some field hands, and brought to me, June 13, 1895.

17. *Sorex longirostris.* Rare. Only seven specimens obtained so far. This species is found on comparatively high ground, not in swamps nor on the edges of them ; it has not so far been taken in woods, though one specimen was caught just on the edge of some woods. This is the smallest of our mammalia.

18. *Blarina parva.* Little Blarina. Tolerably common. Is either only abundant in particular situations, or else it has become much scarcer in the last few years. Is found in open fields (and the edges of the more upland marshes to some extent).

19. *Blarina carolinensis.* Carolina Blarina. Abundant. This species I believe to have become more abundant of late years; its distribution here is the same as that of *Peromyscus leucopus,* namely, everywhere, except in the wetter marshes, where *Oryzomys palustris* and *Microtus pennsylvanicus* are the only small mammals.

20. *Scalops aquaticus.* Common Mole. Abundant everywhere.

21. *Vespertilio lucifugus.* Little Brown Bat. Rare. Only two specimens so far.

22. *Lasionycteris noctivagans.* The Silver Black Bat is rather rare here. I have several times had specimens brought to me in winter that were captured in hollow trees.

23. *Vesperugo carolinensis.* This and the Red Bat are our two most abundant bats. Very common.

24. *Adelonycteris fusca.* Large Brown Bat. Rare. Only about a dozen specimens taken.

25. *Nycticejus humeralis.* The Twilight Bat is fairly common here, but never occurs in half the numbers of the Red Bat, or *Vesperugo carolinensis.*

26. *Atalapha borealis.* Red Bat. Abundant. This bat flies later in the autumn and earlier in the spring than any other of our bats. The number of young at birth is usually three, while in *Vesperugo carolinensis* and *Nycticejus crepuscularis* two is the normal number.

27. *Lutra hudsonica.* Otter. Occurs on all the larger streams. My brother, H. H. Brimley, has caught eight specimens at various times.

28. *Mephitis (sp).* A Skunk was killed near Raleigh a few years ago, the only one we ever heard of.

29. *Lutreola vison lutreocephalus.* Southern Mink. Common along water-courses. The females (and sometimes the males) are not infrequently brought to me as "Weasels."

30. *Putorius noveboracensis.* Weasel. One male caught by my brother, when trapping, January 13, 1888. I have heard of others, but have never been successful in getting them.

31. *Procyon lotor.* Raccoon. Quite rare in the immediate vicinity of Raleigh.

32. *Urocyon cinereo-argentatus.* Grey Fox. Not infrequently caught by fox-hunters in this vicinity. The Red Fox is said to occur in adjoining counties.—C. S. BRIMLEY.

ENTOMOLOGY.[1]

Insects Affecting Domestic Animals.—In the last issue of the new series of Bulletins of the U. S. Division of Entomology (No. 5), Prof. Herbert Osborn devotes nearly 300 pages to a treatment of this subject. The bulletin is an important and extremely useful one, with 170 illustrations. In the introduction there is a general discussion of parasitism from which we extract the following regarding the origin

[1] Edited by Clarence M. Weed, New Hampshire College, Durham, N. H.